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AEROSPACE

Launch of Ariane-4 Third-Stage H10+ Said to Demonstrate Competitiveness

92WS0512A Paris *LIBERATION* in French 16 Apr 92
p 10

[Article by Paul Loubiere: "Ariane Challenges"—first paragraph is *LIBERATION* introduction]

[Text] It was scheduled to take off last night for the fiftieth time, inaugurating the H10+ third-stage and carrying two communications satellites. A European technological success, Ariane bagged 78 percent of the commercial satellite market in 1991. But its first place is threatened.

For its fiftieth flight, Ariane is getting two treats: prestige and money. Whether it takes off or explodes, it has achieved the largest number of consecutive successful flights in history: 14 zero-fault flights since the accident of 23 February 1990, when a forgotten rag perturbed the operation of one of the first-stage motors. There's prestige for you.

More important, it bagged 78 percent of the commercial satellite market in 1991, which enabled it to harvest a profit of 130 million francs [Fr] in 1990.

If all went well, Ariane took off last night between 0112 and 0157, carrying two communications satellites, Telecom-2B and Inmarsat-2-F4, its seventy-ninth and eightieth satellites. On this occasion, Hubert Curien, who was just put back in charge of space activities in the government, is returning to his old love; he was one of the fathers of the L3S program, the ancestor of Ariane in the 70s. In 1979, when Frederic d'Allest created Arianespace, everybody said he was crazy. The Cassandras saw it as another Concorde or La Villette project. The most optimistic expected to see about 10 successful launches by the end of the century. As for the Americans, they dismissed Ariane as uninteresting old-fashioned stuff. Thirteen years later, the demonstration has been made that Europe possesses the best space technology in the world.

Apart from the symbol, the National Center for Space Studies (CNES) and the European Space Agency (ESA) attach much importance to this fiftieth flight because it will use the new H10+ third stage which can bear a heavier load. "For us, it will be a way of showing that the launcher could be further improved and to give our two clients a still better orbit," people at Arianespace explained. Operating 28 seconds longer and burning an additional 340 kg of propellant, this third GTI stage enables Ariane 44L models to put up to 4,470 kg into geostationary orbit (36,000 km), i.e. 100 to 130 kg more than before. This weight will not be reached on this flight since the launcher will carry only 4,101 kg, including the 3,585 kg of the satellites. Now equipped with the H10+ stage sponsored by the CNES and ESA and developed by

Aerospatiale and MBB [Messerschmitt-Boelkow-Blohm]-Erno, Ariane launchers will be 32 cm longer, reaching a total length of 57.3 meters.

Yet, although Arianespace's backlog of orders includes 31 satellites, corresponding to an estimated total of Fr13.6 billion (each launching is estimated to cost Fr600 million, but several satellites are usually launched at the same time), the Europeans' current domination over the market may not last long. Next to the American Atlas and Delta and the Chinese Long March launchers, there will come the Russian Protons which have already been officially offered to launch the third-generation Inmarsat satellites starting in 1995. In addition, in spite of the setbacks they have experienced (one technician was killed when the motor exploded during last summer's tests), the Japanese aim to get 20 percent of the market by 2000.

The current success of the European launcher is due to the setbacks suffered by its competitors. The Soviets, who used to be the leading satellite launchers worldwide (over 100 per year!), are now in disarray. As for the Americans, they have accumulated errors: In 1983, Ronald Reagan staked all on the space shuttle and forced NASA to give up traditional launchers. When Challenger exploded in flight in 1986, the U.S. program was interrupted for 32 months. As we saw, Ariane was able to take advantage of it.

Far from resting on its laurels, Ariane is intensifying its efforts: The H10+ stage was scheduled for the 55th Ariane only, but since all checks had been completed, Ariane tried it for the first time last night, one month before the meeting of all its former or potential clients, scheduled to take place in Paris on 18 May. If all goes well, this meeting should be marked by the signature of its 100th contract. Since 1981, it has already signed 99 such contracts. It has successfully launched into orbit 83 satellites of all types, mostly communications satellites.

The real threat to the Europeans comes from "exotic" launchers, less reliable but costing a lot less. To remedy the situation, Arianespace changed its construction strategy. Instead of building its launchers one by one, as it needs them, it started series production. Fifty Ariane-4 were thus ordered at one shot in February 1989, totaling over Fr24 billion. The order is to be delivered over eight years and brings the European space industry into the industrialization stage. Until then, launchers had never been produced in such large quantity anywhere in the world, with an objective of quality and productivity and the concern to lower costs. The entire industrial chain participated in this effort, and the same was true at the Guiana Space Center, where the overhauling of operational procedures and the intensification of controls were improved, leading to a five-day reduction of launching campaigns.

BIOTECHNOLOGY

German Law on Genetic Engineering Discussed by Industry

92MI0398 Bonn *TECHNOLOGIE-NACHRICHTEN*
MANAGEMENT-INFORMATIONEN in German
29 Feb 92 p 2

[Text] Problems over liability arising from the law on genetic engineering were raised by the CDU/CSU [Christian Democratic Union/Christian Social Union] parliamentary group at the start of a public hearing on "experience with the law governing matters of genetic engineering," to which scientists, ecologists, and representatives of industry, management, and labor unions had been invited by the Research and Health Committee.

Small and medium-sized enterprises, whose genetic engineering products are not competitive in the German market, were particularly affected, it was claimed. Although larger industrial companies could afford the financial investment, the CDU/CSU saw a risk that liability issues might encourage them to emigrate "to friendlier countries with better local conditions." The SPD [Social Democratic Party of Germany] considered that the laender had particular problems with the new requirements, owing to the great uncertainty still prevailing among the licensing authorities. Alliance 90/The Greens stated their basic position as follows: "The genetic engineering law still presents weaknesses. It is important to amend the law's general provisions so as to ensure real protection for the population."

"The safety levels are treated in more or less the same way for the purposes of implementing and applying the law," commented Professor Ernst Winnacker of Munich University. He considered that safety level 1 should require less documentation than level 4, as level 1 entailed a lesser hazard to human health and the environment. Furthermore, 97 percent of research applications fell under level 1 stated Winnacker, so an amendment to the law could substantially facilitate research. Professor Helmut Altner of the Committee of University Rectors stressed that the cost incurred in complying with the law could no longer be borne by the already overstretched universities. Regarding the practicality of the existing legal regulations, Professor Gerd Hoborn of the Central Commission on Biological Safety [ZKBS] criticized the fact that there were still no provisions governing the dispatch of genetically engineered organisms across national frontiers. Dr. Martha Martens of the Munich ZKBS pointed there was a more urgent need to legislate on the transport of substances that represented a higher hazard potential.

There are still substantial discrepancies between EG standards and national regulations as regards practical aspects of the German law on genetic engineering. For example, Dr. Ludwig Kraemer of the EC Commission voiced the criticism that Germany currently had no

plans for lifting restrictions on the marketing of genetically manipulated organisms for testing and field research.

French Researchers Developing Vaccine Against Intestinal Parasites

92WS0435B Paris *LE MONDE* in French 19 Mar 92
p 1, 12

[Article by Franck Nouchi: "Vaccines Offer Hope for Development"; *LE MONDE* introduction is "Human experimentation of an antischistosomiasis vaccine will offer great possibilities for combatting parasitic illnesses."]

[Text] What if the fight against parasitic diseases were not lost after all? And what if, contrary to a belief that is only too common, it became possible to imagine the scourge of endemic parasitic illnesses conquered by vaccines?

Are we finally overcoming the fatalistic attitude with which we too often overwhelmed developing countries—often for lack of any effective aid?

Judging from the contents of certain papers read at the Annecy conference, many researchers are no longer resigned to fighting a lost cause. "After all," summed up Professor Andre Capron, director of the National Health and Medical Research Institute's (INSERM) Immunology of Infectious and Allergic Diseases Unit at the Lille Pasteur Institute, "the international community did not really step up its aid and efforts to combat parasitic illnesses, until 20 years ago. It takes time to develop a vaccine. So it is entirely natural, under the circumstances, that it took us until now to realize that vaccines are feasible."

All, then, is not lost. Indeed, backing up his words with deeds, Professor Capron announced that human experiments of an antischistosomiasis vaccine would be conducted under the aegis of the World Health Organization (WHO), probably before the end of the year. Schistosomiasis is one of the most widespread parasitic diseases in the world. Discovered in 1951 by Theodore Bilharz, it exists chiefly in tropical and subtropical regions.

The parasite responsible for the disease is a small, flat worm, the schistosome, of which five types pathogenic to humans are known. About 200 million people, most of them children and adolescents living in Africa, South America, and Asia, are now afflicted with schistosomiasis. And between 200,000 and 500,000 of them die of it each year.

"Spectacular Effects"

The parasite enters the organism by way of water or contaminated food. Once there, it passes through a fairly complicated cycle that finally brings it to the liver. There it causes various disturbances that affect the intestines, urinary tract, blood, etc., and that manifest themselves

clinically in a bloated liver and spleen (hepatosplenomegaly) and portal hypertension.

The female worm that causes the disease can lay several hundred eggs a day that infest the entire organism. Epidemiological studies conducted in Gambia, Kenya, and Brazil have shown that immunity against the disease appears fairly late, at puberty. Professor Capron's team has also shown that the primary antibodies induced by introducing the parasite into the organism are IgE immunoglobulins.

Later, a lengthy and meticulous study at the Lille Pasteur Institute identified and cloned a protein that apparently has great protective powers. Dubbed P.28, it was genetically engineered by researchers under the direction of Professor Jean-Pierre Lecoq at Transgene in Strasbourg (see LE MONDE, 28 March 1987).

The protein has since been purified, crystallized, and tested in animals. Several studies have shown that it can reduce the production of parasites by nearly 75 percent. Better yet, when administered to infected baboons, it simply wipes out bladder lesions.

"Thus, the P.28 vaccine prototype," sums up Professor Capron, "has spectacular effects on both parasite fertility and the viability of parasite eggs." Experiments with the vaccine on cows in Sudan slashed production of parasite eggs by nearly 80 percent. (Some types of schistosomes, especially in Africa, infest livestock, causing significant growth delays and substantial weight loss.) Human experimentation of the vaccine, which should begin in a few months under the aegis of WHO, was the next step. If the vaccine were to prove effective, it would be the first antiparasitic vaccine ever devised.

In addition to their scientific value, these studies illustrate perfectly the need for researchers, manufacturers (in this case, Pasteur-Merieux Serums and Vaccines), and the big international organizations to cooperate closely in vaccinology.

The Importance of European Firms

The new development of the last few years is the steadily growing role played by European firms in the vaccine industry.

In Annecy, Mrs. N. Baudrihayé of the European Federation of Pharmaceutical Industry Associations (EFPIA) pointed out that 67 percent of the vaccines used by UNICEF between 1985 and 1991 were European made. The trend coincides with a huge, worldwide movement to restructure the industry. Over the last few years, Merieux has taken over Pasteur Vaccins and Canaught, Wellcome has sold its vaccine business to Evans Medical (a subsidiary of Medeva), SmithKline, itself a division of Beecham, has acquired the Belgian company RIT, and the Italian firm Scalvo was incorporated into Biocine, a subsidiary of Ciba-Geigy, and so on.

It looks as if a few years from now not more than four or five large groups will still manufacture vaccines. Such a concentration is not without its problems. Unlike the traditional pharmaceutical industry, the vaccine industry does not generate huge profits. And the low living standard of populations with parasitic diseases means that the industry must even produce at a loss. Under such conditions, it is vital not only to establish the type of cooperation mentioned above, but to involve governments in the research effort to develop new vaccines.

New vectors will probably make it possible within a few years to administer several different vaccines in one injection. With 88 of the 92 million births each year occurring in developing countries, the potential importance of such strides is evident. But lest we harbor any illusions, we should remember that this progress has a price. Not so much the price of the vaccine, which accounts for only 7 to 10 percent of the cost of a mass vaccination program, but of the salaries of the health-care workers who implement the program (about 60 percent of the total cost).

Political leaders are usually more than willing to acknowledge that health is a major factor in a country's economic development. And they agree that underdevelopment is a factor in an instability that, in the long run, may be very harmful to industrialized countries. When will they move from words to deeds and give real meaning—at last—to their aid policies for developing countries?

COMPUTERS

German Neural Network Research Described

92WS0481A Stuttgart BILD DER WISSENSCHAFT
in German Apr 92 pp 40-44

[Article by Hans Schmidt: "Artificial Prophets: Neural Networks Simulate Chaos"; first paragraph is BILD DER WISSENSCHAFT introduction]

[Excerpts] Neurocomputers are intended to help wherever intellect and mathematics fail. The international contest for this future technology has begun. This time, the Europeans are in the lead.

[passage omitted] The behavior of stock markets during a market crash is a prime example of chaos in the literal and mathematic sense. Electronic brains are just as helpless as human ones when faced with chaotic events: Computers were the main culprit behind the legendary stock-market crash of 1987. Even the most powerful conventional computers can only process problems that can be described analytically with mathematical equations. They fail at complex systems, especially if nonlinearity, time variance, and chaos are involved.

The broker of the future is currently under development at the Siemens Research Center in Munich. It is a neural

computer system that is intended to provide reliable prognosis and decision-making assistance on economic questions. "A stroke of luck for the economy," says technical project head Hans Georg Zimmermann. "Because of its aptitude for simultaneously modeling many influencing factors and nonlinear interactions, we now have a mathematical instrument that allows us to formulate sound prognoses concerning interest, overall business, and exchange-rate trends, but also predictions of sales figures, expected orders, and price trends."

For practice, the computer system was first fed interest values and other key economic data from the past 10 years. The system then tried to weigh the many factors influencing interest trends and make predictions for three-, six-, and 12-month periods. Through continual cross-comparisons with actual trends and ongoing adjustments in its own program, the system increased its prognosis accuracy—still within the data set known to it.

After the training phase, the evaluative know-how was applied to future development. It proved to be the case that the network achieved far better results than conventional prognosis models or human experts. With respect to the short-term trend in the rate of the dollar as well, the neural network generally guessed correctly, even if the data were incomplete, imprecise, contradictory, and of varying significance to the trend.

The neurocomputer distills out the important structures completely independently of the data material, in contrast to expert systems, which ultimately reflect only the structural understanding of their author. Conventional mathematical prognosis models work either with a very large number of variables, which interact with each other in a linear fashion, or with very few variables in complex interaction. Both possibilities have little to do with reality.

This is not the only neural project on which Siemens researchers are working. Because neural networks are suitable for any type of pattern recognition, they can be used to understand handwriting and spoken words. "Concrete applications in the field of credit," Zimmermann says, "include recognizing a signature that can be verified even while it is being written on a touch-sensitive screen, solely from the motion involved, and in risk analysis in the issuing of loans."

At the University of Erlangen, a neural network is helping distinguish between the biomagnetic signals coming from the brain and the interference signals coming from the heart. With the "Krenikon" machine, doctors can localize the position of an epilepsy center in the brain, for example. Electric activities can be precisely localized from the magnetic field distribution within the organism. In this application, the neural network acts like a filter, separating out the interference signals of the heart muscle from the recorded data. The software simulates a massive screen between the heart and brain without disrupting the bioelectric brain signals. In the

quality control department of Siemens' Wuerzburg electric motor plant, a neurocomputer specializing in acoustic pattern recognition checks for automotive fan motors that do not rotate perfectly—this was previously the task of human inspectors. No easy task: An inspector had to monitor 2,000 fan motors per shift. Now the computer records the motor noises by way of a structure-borne sound microphone. It analyzes, logs, and evaluates them—around the clock. In hundreds of variance comparisons, its neural network has learned to detect the slightest irregularities in the rotation.

In a few weeks, after three years of work, the research department will present the first prototype of a neural chip—the first sample of a completely new type of hardware, which is supposed to operate a million times faster than present-day neural networks.

Specifically, the current machines simulate the work of a neural architecture only on conventional digital computers. With this project, the German electronics concern is joining the world's leaders in this field. It is in good company there: The United States' biggest chip manufacturer, Intel, IBM, and AT&T Bell Laboratories are also working feverishly on developing neural hardware.

Siemens' example clearly shows the value attached to the supposedly exotic technology by the electronics industry.

All industrial states have recognized the potential of neurocomputer systems. An army of scientists is concentrating on the specialized area: approximately 10,000 researchers worldwide, of which 4,500 are in the United States and 3,500 are in Europe. In 1992, the research machine is running full steam ahead in all high-tech countries.

[passage omitted] The international distribution of roles will probably work out splendidly once again: The European researchers will have the creativity breakthroughs; the results will be taken up scientifically, marketed, and consolidated in the United States; and the Japanese will take care of commercial applications.

The Europeans are entering the ESPRIT [European Strategic Programs for Research and Development in Information Technology] microelectronics program, which goes from 1988 to 1993, in the race; this program contains a large share of neurocomputer research (total budget: 6.4 billion German marks [DM]). Even in its initial stage, neurocomputer specialists fled the EC's JESSI [Joint European Submicron Silicon Initiative] program, which was intended as a response to the technological lead of the market forerunners. The EC program, which is funded for DM8 billion and is supposed to run until 1996, was recently cut back from the original 40 individual projects to 20—the semiconductor producers' lobby was stronger.

In England, the importance of this field of research is appreciated to a degree similar to that in Germany,

although there is much less financial support by the government—the economy is in distress.

Thus far, the French have not made a clear move in any direction: Bickering between individual ministries and regions over jurisdiction is getting in the way of a national plan. In both states, moreover, a "discernible" part of the research funding comes from the military budget.

Which brings us to the only national initiative of European neurocomputer researchers: the German information technology program of the BMFT [Federal Ministry for Research and Technology]. The first phase of the cooperative for neurocomputer engineering ran from 1988 to 1990 and was supported by DM3.5 million a year. The current, significantly expanded phase, from 1991 to 1994, has at its disposal around DM12 million a year, with which 11 cooperative projects are supported. Each project includes three to five partners, whereby the share occupied by industry fluctuates between 10 and 20 percent. This is exclusively civilian research; not a penny comes from the defense budget.

A number of Bundeslaender have intensified their devotion to neurocomputer research; in North Rhine-Westphalia, for example, several professorial positions have been created. In all of Germany there are around 10 university chairs for the field; in the United States, in contrast, there is not a single one thus far.

Staying power is needed, according to Professor Eckmiller: "The development of neurocomputing is still so much at the ground level that it would be a big mistake to get involved in the type of rush projects that the Americans are doing." His Department of Biocybernetics at the Institute for Physical Biology of the University of Duesseldorf is working on a robotics project. The goal is to replace the conventional control system for a modern, six-axis industrial robot with a neural network control system within the next four years. In the meantime, a Fraunhofer Institute is developing the neural hardware, and a Dortmund robot research institute is providing the conventional robotics know-how.

The biocybernetician believes that he is far removed from the animal model. "We certainly do not say, 'Here are the data from the monkey, and now we'll use them to control the Siemens robot.' The gap between brain and computer is very, very great." Neurocomputer research is simply striving to find new computer technologies.

Ultimately, all of these programs will only serve to improve national competitiveness. What is really needed, Professor Eckmiller says, is the development of teachable neural computers for the purpose of providing for the future on a global scale.

His vision: In an internationally planned program, teachable computers are linked to satellite systems for recording data in order to simulate various complex supraregional or even global systems for the purpose of prognosis. In this way, previously unsolvable problems

such as weather forecasting, the ozone distribution, and resource monitoring could be handled on a global basis, and other problems such as smog or traffic tracking could be handled on a regional basis.

The opportunity is unique, the scientist says: "Precisely in the phase during which things are becoming dangerously constricted, dirty, and life-threatening on earth, humanity is creating powerful technologies to get a handle on complex systems. This technological development offers extremely far-reaching possibilities for ensuring the global future."

UK Launches Artificial Intelligence Research Program

92WS0541C London *INTERFACE EUROPE*
in English Apr 92 p 16

[Text] The DTI has announced a new programme for the promotion of collaborative research on artificial intelligence. The budget will be £22 million over the next five years, and the programme will be strongly user oriented and focus on knowledge based decision support. Special attention will be given to the engineering of KBS processes, practical problem solving with proof of scalability, and the development of matrices for cost and performance. Emphasis will be placed on quality assurance techniques and standards. Expressions of interest are invited; the response will help shape the work plan and the programme themes. Further information is available from: Adrian Wheldon, ITD3, DTI, 4th floor, 151 Buckingham Palace Road, London SW1W 9SS. Tel: 071 215 1267/1257.

DEFENSE R&D

France: Rafale M01 Test Program Proceeding at Full Speed

92WS0489A Stuttgart *FLUG REVUE* in German
Apr 92 pp 51-54

[Article by K. Schwarz: "Navy Version of New French Fighter: Rafale Ahoy!"; first paragraph is *FLUG REVUE* introduction]

[Text] "Rafale ahoy!" is what the French Navy should be saying as early as the end of 1996. For this reason, testing of the modern multipurpose fighter plane is in full swing at the Istres testing center. The program is of paramount importance not only to Dassault Aviation, but also to the country's entire equipment industry.

While the Jaeger 90 will not make its maiden flight until the middle of the year, France's new Rafale fighter has been reeling off its test program in Istres since May 1991. With experience from more than 650 flights of the Rafale A demonstrator under the belt, the tests appear to be going quite satisfactorily, with some performance levels that are said to exceed the contractually required values.

Thus, the M01 navy version was able to open up the entire flying range in only 10 uses. Yves Kerherve, who recently became the chief test pilot at Dassault, lifted the solid-gray machine off the runway in Istres for the first time last 12 December. He immediately accelerated the Rafale to Mach 1.4 using the afterburner, and achieved an altitude of 42,000 feet. After several tests at low speed, he touched down at around 240 km/h.

According to information from the manufacturer, the program is thus completely on schedule, especially since the prototype C01 has in the meantime completed 75 flights and achieved speeds of up to Mach 1.8. The maximum reported altitude is 50,000 feet (15,240 meters); the greatest angle of incidence thus far has been around 30°, and the load factors have been around +9 and -3 g. Thus far, the M88 engines by SNECMA have offered no reasons for objection.

Catapult Tests in United States Planned

Especially important is the good behavior at speeds down to 100 knots (180 km/h). Approaches are said to be possible at 10 knots slower than estimated, which will facilitate carrier landings. The first tests in this regard are planned for mid-year. Since Europe no longer has any suitable facilities for catapult tests and simulated deck landings, the Rafale M01 will take a one-month trip to the United States in July.

The first landings on the "Foch" are planned for April 1993. By that time, this French carrier will have undergone a retrofitting program in which, among other things, the landing aids and catapults will be adapted to the needs of the Rafale. The navy version of the Rafale is currently the top priority, because it is supposed to be delivered as early as the end of 1996, at least according to official information. After the training of pilots and service technicians in Landivisau, the first squadron of a dozen airplanes should be ready for use in mid-1998.

The Rafale M differs from the land-based Rafale C one-seater primarily in terms of its landing gear. Messier-Bugatti reinforced the primary units in order to absorb the enormous landing impact with vertical descent rates of up to 8 meters a second. The nose unit was completely redesigned, since in contrast to prior French practice it must absorb the catapult forces, which can reach 120 tonnes. During takeoff, even with a Harrier-type ski jump, the telescopic strut is extended instantaneously in order to provide for an optimal angle of incidence.

Naturally, the equipment for deck landings also includes electronics for the approach, as well as a tail hook. Here, as in the landing gear, the airframe had to be reinforced. At the request of Aeronavale, moreover, an access ladder was integrated into the fuselage. In addition, particular value is attached to good protection against corrosion. An ingenious tank display is installed in order to provide precise information on fuel reserves—and thus the landing weight—at any time.

According to Dassault, 80 percent of the structure and 95 percent of the systems are identical in the versions M and C. The reported weight difference is 750 kg. However, this could drop even further, since the Armée de l'Air is apparently leaning towards taking the navy version as its basis and making only a few slight changes.

At the moment, it is not yet clear what the air force's procurement strategy is. In any event, there is a strong tendency to procure as many two-seaters as possible. The green light for mass production of the navy one-seater and the two-seater is in any case expected by the end of this year.

Running parallel to the flight tests of the Rafale, development of the individual systems and of the necessary "accessories" is in full swing. Last December, for example, firing tests with the GIAT 791 gun began in Cazaux on board a Mirage III. Tests in the Rafale C01 are due to begin in July.

In the meantime, Matra has conducted the sixth launch of its Mica air-to-air guided weapon from the Landes test center. The missile, equipped with an active radar search head, intercepted a CT 20-type target drone at "medium range."

In mid-February, Sextant Avionique was awarded the contract to develop the OPSIS helmet visor, which can provide the pilots with all necessary flight and weapons data. They are projected directly onto the visor in front of the eyes without disruptive optics. In this way, it should be possible to limit the weight of the helmet, which was designed in conjunction with Intertechnique, to 1.45 kg.

Sextant is also supplying the Mermoz testing system, with which the systems on the Rafale can be checked out on the ground. Orders have already been placed for 55 units, valued at 500 million German marks. The first ones will be used for acceptance of the mass-produced Rafale machines as early as the Spring of 1994.

From the technical standpoint, the parties involved with the program thus far have reason to be quite satisfied. Still, even the "Grande Nation" must economize on its military spending. This is why the Ministry of Defense recently reiterated that "it is absolutely necessary to remain within the projected cost framework." Thus, one step that is being taken to relieve a little pressure in the 40 billion franc development budget, to which industry contributes with its own funding, is to forego a fifth prototype.

EFA Prototype Maiden Flight Delayed

92WS0489B Stuttgart FLUG REVUE in German
Apr 92 p 53 [box]

[Article by K. Schwarz: "EFA Maiden Flight Delayed"]

[Text] Work on the first two EFA prototypes is currently proceeding almost at the same pace as MBB in

Ottobrunn and British Aerospace [BAe] in Warton. Although the airframes have long been finished, delays in the delivery of equipment and in the writing of the extensive software have meant that a maiden flight around mid-year is no longer realistic.

"It is still our goal to present the machine in Farnborough," is what BAe has to say about the new time projections. However, this deadline should be regarded with skepticism, because too many parallel activities remain to be carried out over the coming months. Even if there is no contractually stipulated maiden flight deadline, the industry is under pressure. Specifically, unless certain "milestones" are reached, there is no money. On the other hand, the meager fixed-price contract means that costly overtime is not exactly attractive.

In the meantime, nearly all subsystems have been chosen, although the electronic warfare equipment continues to be problematic. Germany has launched a national bidding competition and received apparently interesting offers with a good cost-performance ratio. Spain now wants to await evaluation of these systems, while Great Britain and Italy continue to lean towards the most recently chosen Eurodass. At present, dual equipment systems for the EFAs appears to be the most likely solution.

Such additional excursions will certainly mean further complications in the current negotiations on conditions for mass production. No one is willing yet to officially provide concrete figures in this poker game, but a reduction in quantity to perhaps 665 machines, the stretching out of production, and a system price (including maintenance equipment, etc.) of around 100 million German marks can be assumed.

Sweden: Continued Development of Gripen Fighter Deemed Certain

92WS0489C Stuttgart FLUG REVUE in German
Apr 92 p 54 [box]

[Article by K. Schwarz: "Gripen: Procurement Certain"]

[Text] Since the conservative victory in last fall's elections, Saab's military aircraft division can be more confident about the future. International trends notwithstanding, the ruling coalition has agreed to increase defense spending over the next five years by 7.3 billion Swedish kronor, taking it to 36 billion kronor (9.7 billion German marks). In this way, all doubt concerning procurement of the new Gripen fighter has been eliminated.

This does not mean that the negotiations currently under way on the second production lot are easy. Specifically, the industrial consortium JAS, to which Ericsson and Volvo Flygmotor also belong, must be mindful of recouping losses from development.

As far as progress in testing is concerned, the latest reports from the FMV procurement office have been

positive in every regard. The four prototypes had completed 323 flights by the end of January, and for the first time the Gripen was also examined closely by FMV pilots. Lately, in order to speed up the tests, two flights with only a brief refueling break have often been carried out.

Now that the domestic market is covered, Saab is redoubling its efforts in terms of exporting the Gripen. Especially notable in this regard is the fact that the trend towards increasingly expensive fighter planes has been halted with this machine, which is well-suited for raid operations, ground attacks, and reconnaissance. The Gripen should be only about half as expensive as the EFA or Rafale. The first test of Sweden's marketing skills is the fighter competition in neighboring Finland. There, the air force wants to conduct additional tests with the competitors (F-16, Mirage 2000, F-18, and JAS 39) by the end of March, and then pass on its recommendation to the government.

France: SNECMA's M88 Turbofan Described

92WS0540F Paris LE BULLETIN DU GIFAS
in English 26 Mar 92 pp 1-4

[Text] The SNECMA-developed M88 turbofan marks the appearance of a new generation of engines for very high performance combat multirole aircraft.

M88 designates a family of engines sharing the same core and designed for either single- or twin-engine fighters (interception and penetration) deployed by both air force and naval air wings. The many advanced technologies developed for this engine are also headed for applications in commercial aviation, through the CFM 88 project.

Offering a thrust range from 75 to 105 kN with afterburner (16,800 to 23,600 lb), the M88 marks a significant reduction in both weight and size compared to current fighter engines. It meets the strictest requirements of today's combat aircraft manufacturers:

- unrestricted operation over an extended flight envelope;
- low specific fuel consumption;
- enhanced reliability and stability.

Compared to a previous-generation engine of the same thrust class (Atar 9K50), the M88-2's advanced technology offers the following advantages:

- 36% smaller;
- 45% lighter;
- 40% shorter;
- and 88% higher thrust-to-weight ratio.

The M88-2 version of this engine powers the Rafale C and M models, which will be deployed by the French Air

Force and Navy starting in 1996. Offering a wide range of thrust, suiting numerous applications, this engine should earn a very strong position on the new combat aircraft powerplant market.

Starting with a highly successful test at Mach 1.4 on the Rafale A on February 27, 1990, the M88-2 already has 250 flights under its belt with an excellent reliability. On May 19, 1991, the Rafale CO1 air force prototype powered by two M88-2 engines, reached Mach 1.2 at 36,000 feet on its very first flight. Even at this initial phase, the M88-2 powered Rafale was able to go supersonic without its afterburner.

The MO1 naval prototype also made its first flight this past year, on December 12, 1991. Air force and naval version engines are strictly identical. The 18 engines produced to date have a cumulative running time of 3,000 hours.

Throughout its flight envelope, since extended to 50,000 feet and Mach 1.8, the M88-2 has shown exemplary performance, from low to high speed, with and without reheat, and in stable or high-speed transient flight. It takes three seconds to go from idle to full thrust with reheat.

Design of the M88-2 production engines will be finalized in the third quarter of 1992, and flight testing completed in 1995.

With the M88-2, SNECMA can now call on a high-performance core as a development base for a complete range of aircraft engines which continuously incorporate the latest technological advances.

For instance, to meet evolving market demand, SNECMA can grow the engine to a higher-thrust M88-3 version, for a multirole twin-engine combat aircraft or a light single-engine military aircraft.

An even more powerful version, the M88-4, will come later.

Going in the other direction, an unaugmented (without afterburner) M88-2S or M88-3S would be perfectly sized to power advanced jet trainers.

CFM 88 Project

SNECMA, working with General Electric under their joint company CFMI, is currently presenting the new CFM 88 engine project to airframers. The CFM 88, now under study, designates a family of turbofans in the 12,000 lb to 20,000 lb thrust class, intended for 50 to 120 seat commuters, as well as high-performance business jets and selected military transport applications.

The CFM 88 is based on a core derived from the military M88-2 engine (which powers the Rafale combat aircraft), adding a seventh HP (high pressure) compressor stage. The solid technological skills acquired on the M88 program, combined with extensive CFM 56 program experience, allow a development without risk, and

promise very high dispatch reliability from the moment the CFM 88 enters service. This new engine incorporates the latest advances in noise and emission reduction technology.

The current CFM 56 engine family covers the 18,500 lb - 34,000 lb thrust segment and has been sold for powering 17 aircraft models. More than 5,000 engines have been delivered and orders and commitments are on hand for about 6,000 more engines.

For CFM 88, two fan diameters are currently being considered with a common high pressure section (core):

- a 44 inch fan diameter study version would provide 12,000 to 16,000 lbs of thrust for a market segment ranging from the upper level executive aircraft to the 60-70 passenger regional jets;

- a 55 inch fan diameter study version for the thrust class of 16,000 to 20,000 lbs, with later potential extension to 21,000 lbs within the same fan diameter. This version is a potential engine for aircraft with seating capacity between 80 and 120 passengers as well as for military transport aircraft.

A technical package describing the 55 inch fan version has been submitted to European airframers for evaluation on new regional aircraft projects, and in the near future the 44 inch fan version will be provided for evaluation on other applications.

The market for those powerplants has been estimated at 6,000 units between 1995 and 2015. But this will depend on how many regional transport jets are developed, and their thrust requirements. The key feature of this new market segment is not just the engine's fuel consumption, but above all the purchase and maintenance costs, which represent over 50 percent of direct operating costs.

The CFM 88 is designed to fit all these criteria. Clean, simple engine architecture facilitates maintenance and reduces operator costs, while assuring excellent performance.

In the long run, the CFM 88 family is a leading new or retrofit powerplant candidate for all aircraft requiring this class of thrust.

A thorough market study is being conducted to obtain appropriate information before a firm program launching decision is made.

France Thomson-CSF To Develop External Transmission Subsystems for Aircraft Carrier

92WS0541A Paris LA LETTRE HEBDOMADAIRE
DU GIFAS in English 2 Apr 92 p 2

[Text] Delegation Generale pour l'Armement has just placed a 100 million franc contract with Thomson-CSF for developing and building two Sytex external transmission subsystems for the aircraft carrier Charles de

Gaulle. They are used for processing top secret information in total security on an around-the-clock basis. One Sytex platform will be set up at "Centre d'Etudes de Recherche en Telecommunications" (CERTAL) in 1994 for an 18-month technical analysis and operational observation period before being installed on the Charles de Gaulle. The communications management and control subsystem (SSG) collates all surveillance functions from the exterior. A single operator can configure VLF, LF, MF, VHF, UHF and SHF transmission channels in accordance with land and naval air force liaisons while operators have direct access to radio services from their terminals. The SACHEM (subsystem for management and processing of messages) automates management, distribution and transmission at reception levels with regard to on-board telegraph messages. The SACHEM will basically process telegraphic messages coming from satellite connections (Syracuse) or via conventional HF and UHF liaisons. Thomson-CSF also provides interface for the SSG and SACHEM subsystems, the internal aircraft carrier network and the larger broadcasting support (SGD) for which Thomson-CSF is also prime contractor.

ENERGY, ENVIRONMENT

Germany: New Method for Monitoring Hydrogen Fluoride Emissions

92P60230B Duesseldorf VDI NACHRICHTEN
27 Mar 92 p 31

[Text] Mooser Elektrotechnik, Metzingen, and the Karlsruhe Research Center have developed a new method for the analysis of hydrogen fluoride. The core element is a so-called semiconductor diode "prozeaphometer," with which, in particular, the hydrogen fluoride emissions of waste incineration can be monitored. According to the manufacturer, the remote instrument has a detection limit of 0.1 microgram of hydrogen fluoride per cubic meter of gas emissions.

Netherlands: Geothermal Heat Considered as Energy Source

92BR0259 Rijswijk POLYTECHNISCH
TIJDSCHRIFT in Dutch Mar 92 p 8

[Article: "Profitable Terrestrial Heat Is Not Really Getting Off the Ground"]

[Text] Geothermal energy in the form of hot water pumped up from the subsoil can be used profitably in the Netherlands to heat houses, offices, and horticultural greenhouses. In addition, the use of this environmentally safe source of heat is almost the cheapest way to reduce CO₂ and NO_x emissions. The full exploitation of geothermal heat resources available in the Netherlands could result in a saving of 3 to 4 billion cubic meters of natural gas per year.

This was written by Professor Dr. F. Walter from the Faculty of Mining Engineering and Oil Development in a recent issue of DELFT INTEGRAAL, the scientific magazine of the Technical University of Delft. In neighboring countries with the same geological characteristics as the Netherlands, hundreds of thousands of houses are already being heated this way, whereas the Netherlands does not even have one single power station. According to the professor from Delft, this lack of interest in geothermal heat is attributable to the energy companies' unfamiliarity with it and the huge gas reserves available in the Netherlands.

This calls for a brief explanation. If someone were to descend deep down into the earth, it would not be necessary to take along many clothes. Every 100 meters, the temperature increases by roughly 3°C. The permeable, porous layers (aquifers) that are found at a depth of 2,000 meters hold water which has a temperature of 60° to 70°C. By pumping up hot formation water and by passing it through a heat exchanger, about 4,000 houses can be heated per doublet [source and drain wellbore]. Because formation water is salty, it is reinjected into the aquifer via a second wellbore after use. Together, these wells form a doublet. In the Netherlands, geological conditions are propitious to the production of geothermal energy. According to Professor Walter, an aquifer at a depth of 2,500 meters with a temperature of 80° to 90°C can supply between 7 and 9 MW of heat.

The costs involved in geothermal heat exploitation in the Netherlands should not be prohibitive, since part of the infrastructure needed is already there in the form of wellbores and urban heating networks servicing 150,000 houses. Every year, five test bores are made which produce only hot water instead of oil or gas. By adding a second well to such an existing well, the required doublet is obtained. Professor Walter calculated that this would reduce the start-up expenses for a geothermal power station by more than 6 million guilders to only 13 million guilders.

In 1992, the NAM (Dutch Oil Company) is going to carry out an exploratory drilling in Delft-South. If only water is found instead of oil, it will surrender the well for production of geothermal heat.

EC Long-Term Environment Plan Outlined

92BR0266 Groot-Bijgaarden DE STANDAARD
in Dutch 11 Mar 92 p 1

[Article by Antoon Wouters: "EC Commission Revises Environmental Policy and Rejects Idea of New Nuclear Power Stations"]

[Text] Brussels—During the next few months, the EC Commission will put finishing touches on a completely revised version of its environmental policy with a view to achieving "sustained development" in the EC by the end of the century. Sustained development means that present generations meet their own needs without jeopardizing the development of future generations. The

Commission therefore rejects the implementation of new nuclear power stations, turning instead toward renewable sources of energy for the production of electricity.

The draft paper, entitled "Towards Sustainability," to which our editorial staff had access, provides another, prozaic definition of sustained development: "Do not eat today the seeds of tomorrow's harvest."

Challenge

The 1980s was an era marked by the establishment of the single market. The challenge for the 1990s will be the achievement of sustained development. According to the EC Commission, durable economic growth can only be achieved if the environment is not regarded as an obstacle, but as a vehicle toward efficiency and competitiveness.

A major change in the revised policy is the fact that pollution and environmental damage will no longer be allowed to occur, but that action will be taken upstream from products and activities in order to prevent pollution.

It is absolutely out of the question that new nuclear power stations will be built in order to generate the 11 billion watts of electric power needed. The emphasis will lie on renewable sources of energy.

At the environmental summit in Dublin (June 1990), the EC ministers of the environment adopted the principles of sustained development and prevention. The Fifth Environmental Action Program is designed to achieve that goal by the year 2000.

Between 1992 and 1995, the EC Commission will reorganize EC policy in that sense, and between 1996 and 2000, it should be fully in effect.

Main Goals

The new environmental policy must be implemented in a period of major changes: the single market, the development toward economic and monetary union, the pursuit of political union, the political and economic changes in Central and Eastern Europe, and policy revisions in the fields of structural funds, agriculture, transportation, and energy.

The EC Commission intends to establish a framework of cooperation with industry, because industry does not only play a role in causing environment problems, but also in solving them.

The main goals include the integrated monitoring of pollution through licenses, inventorying emissions, making environmental audits, levying environmental taxes, and implementing the cleanest possible technologies. Through economic and fiscal measures, a system of deposits, and strict dumping regulations, waste piles could be reduced. The manufacture of environmentally safe products is stimulated through the introduction of

the "Eco-label," product standards, increasing consumer awareness, and tax benefits.

The energy sector is a cornerstone in the sustained development policy, and requires a strategy reaching far beyond the year 2000. In the short and medium terms the commission will focus on energy saving and on the development of technologies to reduce carbon emissions.

Through economic and fiscal incentives, the emission of CO₂, SO₂ and NO_x will be restricted. Alternative and renewable sources of energy—such as biomass, wind, tidal, solar, hydrothermal, and geothermal energy—will be encouraged.

In the field of transportation, EC Commissioner Van Miert published a "Green Paper for Sustained Mobility" last month. In this field, the EC aims at cleaner cars and fuels, EC control on the number of cars, the reduction of fuel evaporation, and a better infrastructure. Awareness campaigns and economic and tax measures are expected to urge citizens to adopt a different driving and traveling attitude.

Balance

The present common agricultural policy is conducive to overdevelopment and to the pollution of agriculture's natural resources, in other words to soil, water, and air pollution. In addition, there is the problem of agricultural surpluses as well as sociological problems due to the depopulation of rural areas.

The balance can be restored by returning to extensive and organic farming, by reducing the use of pesticides, by implementing development programs for rural areas, and by reforestation and long-term afforestation.

Finally, the EC points out that the tourist sector is causing more and more environmental problems and that a policy of sustained tourism is urgently required if tourists are not to be swamped by their own dirt.

Germany: Alternative Energy Sources Discussed

92MI0344 Bonn WISSENSCHAFT WIRTSCHAFT TECHNOLOGIE in German 4 Mar 92 p 5

[Text] Phosphoric acid cells for natural gas-fired combined heating and power systems with electrical outputs in the 100 kilowatt to 11 megawatt range were demonstrated at the 11th Conference on Hydrogen Power Engineering in Nuernberg at the end of February.

Other types of high-temperature fuel cells are also under development and appear suitable for large-scale electricity generation. Using fuel cells to generate electricity is expensive (mobile: 30,000 - 50,000 German marks [DM]; stationary: DM2,000 - DM5,000 specific costs per KW of electricity). In theory, electrochemical combustion of hydrogen in fuel cells is capable of 70-90 percent efficiency. Alkaline and membrane cells operating below

100°C are limited to military and space applications. Development programs have given an innovatory thrust to electrolysis of water.

The conference was organized by the "Renewable Energies" specialist committee of the VDI [Association of German Engineers] Power Engineering Association and by the VDE [Association of German Electrical Engineers] Power Engineering Association, in collaboration with the German Aerospace Research Institute, Solar Energy and Hydrogen Research Center, Bavarian Solar-Hydrogen, and the Society for Introducing Hydrogen into Energy Management. Around 300 experts took part in the conference, which was led on the scientific side by Professor Carl-Jochen Winter VDI, Dr. Manfred Fischer, and Eng. Martin Fuchs VDI.

The conference discussed the latest technical and scientific results and the short- and medium-term options, from which it emerged that only a few collectible energies can be used in means of transport, as the energy has to be carried on board, refueling has to be possible, handling has to be simple and safe for the lay person, and the energy has to be available in large quantities and at low prices. The major reasons for studying hydrogen as a new source of energy are to protect the environment and to maintain the long-term availability of fossil fuels. Any change in source of energy triggers a chain of consequences. Pilot projects were presented.

Innovations grow out of research, development, demonstration, and marketing of technical components and the systems that they make up. The solar hydrogen energy system only achieves efficiency rates of below 10 percent. From the energy point of view it is important to take advantage of the high efficiency rates of fuel cells to enable the entire system to attain acceptable efficiency rates. Germany leads the field here with a number of systems and projects.

Great imagination and creativity were shown by the designers who presented their hydrogen-fueled world of the future at Nuernberg. Nevertheless, discussion of these ideas returned to the basic point that hydrogen is not a naturally occurring energy source. If hydrogen is produced from primary energy by water electrolysis, the fact remains that all hydrogen energy was previously electricity. There are thus advance plans for structural changes in energy management: Wherever possible, primary energy sources will be used on the spot, and the use of electricity will be stepped up. It is difficult to identify immediate scope for using hydrogen within the present system.

France: Motor Oil Additive Reduces CO Emissions
92WS0390C Paris L'USINE NOUVELLE in French
20 Feb 92 p 64

[Article by O. L.: "An Anti-Pollution Product That Saves Energy"; first paragraph is L'USINE NOUVELLE introduction]

[Text] BGS has commercialized an oil-soluble resin, which, when added to motor oil, reduces CO emissions by 20 to 30 percent, and reduces fuel consumption by 2 to 4 percent.

Another of those miracle products, one might say. So be it, but the results speak for themselves: The contents of the small Technologie A 9 bottle, commercialized by BGS, mixed with an engine's oil, reduces the engine's fuel consumption and its carbon monoxide emissions.

In 1946, the Biro family created and manufactured fire-fighting products and equipment. Years later, Guy Biro researched a means of protecting the engines of collectors' automobiles from the aggressivity of modern motor oils. Calling on his experience in the field of chemistry, he developed the Technologie A 9 additive.

The technology consists of using the lubricant to transport fluoridated resins designed to deposit a permanent film on all the engine's heated parts. This film reduces the friction of metal on metal and improves the seal between the engine's combustion chamber and crankcase, by easing the sliding action of the rings on the piston. Oil-leaks past the rings are reduced, compression ratios are equalized, and combustion is improved. "The secret is not the product, but the patented process that renders this resin soluble in oil," says Guy Biro.

To validate the performance of its product, BGS submitted it to the INRETS [National Institute of Research on Means of Transport and Their Safety]. Skeptical at first—INRETS has tested hundreds of products of this type—the Institute ran a series of tests over distances of 2,000 kilometers and on 12 different vehicles. CO emissions were reduced by an average of 20 to 30 percent in city driving and by 2 to 6 percent at high speeds. And fuel consumption in the city was reduced by 2 to 4 percent.

Jean-Claude Sicard, of the AFME [French Energy Management Agency], however, expresses some misgivings concerning the "miracle": "This product contains PTFE [polytetrafluoroethylene]," he says. "What happens to it after combustion?"

Simulator Gives Nuclear Safety Training

92WS0482C Paris L'USINE NOUVELLE in French
No 2359, 9 Apr 92 p 29

[Article by Olivier Lauvige: "Screens That Display Nuclear Accidents"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Sipa 1 and 2 will display in real time what happens in a nuclear reactor during an accident, to train safety engineers and operations managers.

The main pumps of the primary circuit have failed. Cooling of the core has stopped. Vapor bubbles are already forming in the pipes and the core is heating up dangerously. Technicians must now react swiftly and

cool-headedly to prevent the reactor from melting down. Soon all nuclear-plant safety engineers and operations managers will be able to train themselves to react to such situations on the Sipa 1 and 2 simulators, which Electricity of France (EDF) and the Nuclear Protection and Safety Institute (IPSN) have just inaugurated.

When accidents occur, the hydraulic circuit of a reactor changes from a simple to a complex state. The water vaporizes, bubbles form, and countercurrents appear. Sipa can simulate all these interactions from scenarios in which nearly all kinds of breakdowns, combined with the most diverse failures, can be envisaged. "But there is one catch," points out Francois Poizat, who is responsible for the project at EDF. "The Sipa tool allows us to devise lines of defense to stop an incident from degenerating into a catastrophe. The goal is to use every possible means to avoid meltdown of the core." That is why Sipa does not simulate meltdown. Are the IPSN and EDF superstitious by any chance?

Shared Software

The system runs on a Cray supercomputer, the one in the Clamart center in EDF's case, and the one at the Saclay research center for the IPSN. Each has absolute access priority, and their computing power can animate block diagrams, curves, and schemas at the rate of 10 to 15 images a second on color screens. This enables technicians to monitor in real time and great detail the condition of the boiler, primary circuit, and vapor generators using an "X-ray type" visualization. Moreover the Aglae computer-based software development environment that was used to program Sipa enables it to simulate any type of water-pressurized reactor. The project began in 1981, and was designed to study in real time accidental transient phenomena like those observed during the Three Mile Island accident. EDF and the IPSN did not team up on a joint project until 1987. Two teams were established to devise the two simulators: one in Villeurbanne for EDF and the other in Fontenay-aux-Roses for the IPSN. Each organization is inaugurating its own installation today. But they share software programs, whose objectives dovetail. The programs will be used first and foremost to train safety engineers and operations managers, to provide them with in-depth knowledge of the physical phenomena that come into play during accidents. The software will also facilitate safety studies and analyses, whether for new projects or to modify the 50 reactors already in service. Finally, officials will use Sipa during emergency drills to simulate nuclear powerplant accidents. EDF, the IPSN, and the Nuclear Installation Safety Directorate regularly organize such drills, either separately or together, to better prepare operators for possible crises. Devising and conducting such drills requires an interactive simulator like Sipa.

Three hundred thousand hours of work were devoted to the project over a five-year period, and the budget for Sipa 1 and 2 came to about Fr130 million. EDF provided two-thirds of the funding, and the IPSN, which received

a contribution from the Nuclear Installations Safety Directorate, the other, one-third.

German Researchers Develop Zeolith Filter for Chemical Emissions

92WS0494B Duesseldorf VDI NACHRICHTEN
in German 27 Mar 92 p 31

[Unattributed article: "Pollutants Can Be Effectively Removed From Exhaust Gas: Molecular Sieve for Exhaust Air: University of Stuttgart Develops Tailor-Made Zeolith Filter"; first paragraph is VDI NACHRICHTEN introduction]

[Text] Duesseldorf, 27 Mar—Exhaust gas can be purified by large-surface adsorbents, such as activated charcoal. More selective and effective than charcoal filters are so-called zeoliths, which filter pollutants from the exhaust current like a molecular sieve.

In the past, purifying gas and separating gaseous mixtures have been achieved through various adsorption methods, whereby activated charcoal is usually applied. In the future, the zeolithic mineral group (aluminum silicates), which is characterized by outstanding adsorptive properties, should be used increasingly for this purpose.

The special crystal structure of zeoliths acts as a sieve that accepts certain molecules but denies access to others. Since the lattice openings can be effectively changed through the conditions during zeolith synthesis, accessibility and mobility in the crystal can be adjusted on a tailor-made basis, so to speak, for a specific filtering task. In addition, zeoliths are not combustible, and are thus suitable for use at higher temperatures.

In a research project headed by the Institute for Chemical Process Engineering, three institutes at the University of Stuttgart are jointly pursuing the goal of tapping into these advantages of zeolithic adsorbents for new areas of application. This is to be done on the basis of two different sample tasks: purifying exhaust air containing solvents from production enterprises, with extraction of the solvents, and isolating a vapor mixture from chemically similar substances. The Volkswagen Foundation has provided a total of 2.6 million German marks for the joint project, which is set to run for four years.

The Institute for Technical Chemistry has assumed the task of choosing types of zeoliths that appear suitable and of modifying them in such a way that they acquire optimal properties as adsorbents.

At the center for the second subproject, which is being conducted at the Institute for Synthetics Technology, the zeolith powder is processed into plastic molding material with good extrusion and shaping properties without detrimentally influencing the sorption properties of the produced form bodies. Finally, the task of the scientists at the Institute for Chemical Process Engineering is to

select, develop, and test suitable processes; particular value here is attached to high separating selectivity and low energy requirements. Ultimately, the "Zeolithic Adsorbents: Synthesis, Shaping, and Process-Engineering Application" project should yield solutions for separating tasks that can be handled using conventional processes only with great difficulty or at great cost.

France: CEA Affiliate To Reprocess Nuclear Waste

92WS0512C Paris LE MONDE in French 17 Apr 92
p 12

[Article by Jean-Francois Augereau: "Inauguration of the New La Hague Unit; Within Two Years, Cogema Will Reprocess 800 Tons of Spent Fuel"]

[Text] At the tip of the Cotentin peninsula, on a wind-lashed coast, the La Hague (Manche) plant has been practicing the tricky art of fuel reprocessing since 1967. Thousands of tons of spent fuel have already gone through these facilities managed by the General Nuclear Materials Company (Cogema), a subsidiary of the CEA [Atomic Energy Commission].

These radioactive materials were reprocessed mostly in the old UP-2 plant, initially built to receive the "metal" fuel from natural uranium-graphite-gas (UNGG) reactor systems, and modified starting in 1972 to receive the "oxide" fuel produced by the many reactors of the light water-enriched uranium type.

The French—Undisputed Leaders

Some 4,000 tons of oxide fuel were thus reprocessed in the plant, which will be thoroughly overhauled to become UP-2 800, while a little over 450 tons were reprocessed in the brand new UP-3 facility. It was this state-of-the-art unit, worth 27.8 billion francs [Fr] and set into service on 23 August 1990, that Cogema officially inaugurated on Tuesday, 14 April, in the presence of numerous foreign specialists, the minister of industry and foreign trade, Mr. Dominique Strauss-Kahn, and the former minister and CEA director, Mr. Andre Giraud who, together with Georges Besse, initiated this project during the seventies.

The reprocessing of spent fuel, a field in which the French appear to be the undisputed leaders, is a difficult operation and very few countries in the world (France, Great Britain, Japan, CIS [Commonwealth of Independent States]) possess the industrial expertise it requires. In addition to the highly radioactive waste produced by fission (3 percent), the "ashes" left by nuclear reactors contain sizeable quantities of reusable materials such as uranium (96 percent) and plutonium (1 percent). And since one ton of spent fuel still represents the energy equivalent of some 22,000 tons of oil, it is easy to understand the interest of the work accomplished by CEA teams.

For the time being, the UP-3 unit alone is working, at a rate of about 500 tons of reprocessed materials per year

and, according to Mr. Jean Syrota, the Cogema chief executive officer, it will take two years before it reaches its full capacity (800 tons per year); over 10 years, it will thus be able to reprocess the 7,000 tons of foreign fuel shipped to La Hague by 29 power companies. Meanwhile, the new UP-2 800 plant will be built to meet the requirements of EDF [French national electric power company], which will nearly double the cost of this huge Cotentin project.

FACTORY AUTOMATION, ROBOTICS

Market for Stored Programmable Control Systems Assessed

92WS0494A Duesseldorf VDI NACHRICHTEN
in German 27 Mar 92 p S18

[Unattributed article: "Automation Systems at Hannover Trade Fair: Control Systems Guide Capital-Goods Sector: Process Automation Grows, Machine-Building Market Segment Slows Down Expansion"; first paragraph is VDI NACHRICHTEN introduction]

[Text] Duesseldorf, 27 Mar—Electronic industrial control systems—especially stored programmable control systems (SPSs)—are the technological basis for electric automation systems. Numerically speaking, the approximately 620 exhibitors of automation systems are the strongest group in the "electrical engineering and electronics" world market at the Hannover Trade Fair (2,400 exhibitors in all). Their market is the entire capital-goods sector: building, process, and machine automation.

After 10 years of—often double-digit—growth in the market for electronic industrial control systems, 1991 was a year of stagnation in the Federal Republic of Germany, with 2.4 billion German marks [DM] in production volume, although it was stagnation with a range from -10 percent to +10 percent. The process and building automation market segments are in good shape; responsible for the slowdown is the high-volume machine-building segment, especially mass-production machines. For the first half of 1992, the industry expects a real improvement of +3 percent on the average.

The market for electronic industrial control systems will grow again, the trade association ZVEI [Central Association of the Electrical Engineering Industry] expects; ultimately, electronics technology is far from being fully exploited. It will open up new areas of application, the association believes, although under conditions of changed market interests: Lower costs take precedence over higher functionality, because rising personnel costs and increasing system complexity always mean higher costs for programming, setup, maintenance, and service. In addition, there are the significant investments for programming equipment, user software, and training.

Because of cost considerations, the call for standards and for longer production cycles is becoming louder. Many planning chiefs would prefer to skip over the next generation of control systems. At the same time, the following trends are being seen:

- The market for small SPS's is growing faster than the market for midsize and large SPS's. Small SPS's and less expensive networks open up new markets in building and process automation. Rapid advances are being made in decentralizing intelligence.
- Control engineering and information engineering are merging to an increasing extent. Even today, the SPS controls and informs. But the demand for information is continuing to grow at a rapid pace. For this reason, the SPS integrates the PC, and for certain machine segments the display and panel will also be integrated.
- But the CNC technology integrated into the SPS is also increasing in interest in terms of special machine-building. High speed with high quality: e.g., lasers, loops.
- Perfecting the technology and cost pressure are accelerating product differentiation according to market segment. More adaptation to customer needs, a greater variety of products.
- Users of complex automation systems are reconsidering: what is necessary, not what is possible. Nevertheless, SPS's with multitasking capabilities will be of increasing interest to these users, in terms of interlinked sequences and super-high speeds.
- The user-friendliness trend means a reduction in user costs. Engineering costs for programming up to the startup phase must be lowered, preferably by 50 percent over the next three years. The hardware is not a cost factor; after all, a powerful small SPS can be had for two programming hours (DM200 an hour).
- The process data highway is rapidly winning over market shares. In the process-oriented area of sensors and drive mechanisms, the technology and the price level are still in flux.
- The demand for qualified personnel for automation is continuing to grow. The requirement profile developed by ZVEI for the training of SPS technicians and engineers will be successful. Numerous industrial companies are already offering such courses with a final examination.

[Photo caption]

Industrial control systems are used in areas ranging from machine-building to ultrafine electronics production. In turn, electronics plays a key role in control engineering. Electronics technology is far from being fully exploited, the trade association ZVEI emphasizes, and for this reason the market for electronic control systems will grow again following an interim drop last year.

LASERS, SENSORS, OPTICS

Dutch Government Promotes Sensor Applications

92BR0280 Rijswijk POLYTECHNISCH WEEKBLAD
in Dutch 19 Mar 92 p 1

[Article by Walter van Hulst: "Industry Still Hesitant Toward Sensors"]

[Excerpt] "Industrial activity in the field of sensors can be regarded as a sensor of future industrialization." This well-turned phrase are the words of Prof. Dr. Eng. J.H. Huijsing of the Technical University (TU) of Delft. If this is true, the Netherlands will have to watch out. Know-how is readily available, yet only a handful of companies dare enter the complicated and capital-intensive world of sensor technology.

"During the industrial revolution, man learned to control mechanical power and later, during the information technology revolution, he learned to control thinking and calculating. Sensors are the last link in the chain of automation," again according to Huijsing. Last week, the sensor in-crowd met for two days in the Brabant town of Veldhoven to harmonize industrial demand with research supply. High-level research in the field of sensors is indeed readily available. Professor Middelhoek of Delft was already at the forefront 20 years ago and now Huijsing in Delft and Fluitman in Twente are also playing major roles.

No Policy

However, industry is lagging behind, both with regard to applications in processes or products and not at all in manufacturing. The Netherlands has some 130 suppliers of sensors but only a handful of companies, such as Xensor Integration, Sentor, and Bronkhorst High-Tech, actually produce them. Approximation switches are imported from Germany and Switzerland; Japan supplies photoelectric sensors; while silicon sensors are imported from the United States. Philips develops and manufactures sensors, but did not have a specific policy for sensors until six months ago. Allegedly, Philips was not even in the sensor business.

Meanwhile, Eindhoven has changed policy, as did the EC in Brussels, which has allocated several million guilders to the establishment of a European network for sensor know-how. The Dutch Organization for Scientific Research (NWO) has recently granted a total of 8 million guilders for a five-year period to the Foundation for Technical Sciences (STW) for sensor technology. The emphasis of this priority program will be on introduction and applications. A national platform will be created that will closely cooperate with similar organizations operating in the area of mechatronics. Besides the organization of congresses and workshops, this platform will also set up a scheme to subscribe to university sensor research. Every quarter, companies receive an update on the state of sensor technology via reports, research papers, and, possibly consultancy. This service will cost

between 4,000 and 10,000 guilders depending on the size and activity of the company. [passage omitted]

SUPERCONDUCTIVITY

Dutch University Develops Next-Generation SQUIDS
92BR0253 Rijswijk POLYTECHNISCH WEEKBLAD
in Dutch 27 Feb 92 p 1

[Article: "New Building Blocks for Superconducting Electronics"]

[Text] The University of Twente has developed new and improved production techniques for the manufacture of so-called superconducting Josephson junctions. It was in this research that Ju Gao graduated this week.

Superconducting Josephson junctions that work well can play a major role in the application of superconducting electronics. Ju Gao, who comes from the University of Beijing, has carried out experimental research into production methods for such components. Among other things, he has been involved with the manufacture of very thin layers of superconducting material on the basis of yttrium-barium-copper oxide, a material which shows superconducting characteristics at the relatively high temperature of 77 Kelvin.

On the basis of this research, the University of Twente is working on the development of a new generation of supersensitive sensors, the so-called SQUIDS [Superconducting Quantum Interference Device]. Such sensors are used in biomedical research. They are able to measure very low magnetic fields, for instance as a result of movements of the heart or activity in the brain.

The Josephson junctions made by Ju Gao are based on the so-called proximity connection of two superconducting electrodes, which are separated by a semiconductor film. The property of this construction is that electrical currents can pass through the switch without any loss of energy. Another characteristic is that magnetic fields (even very small ones), are able to interrupt this current. Use can be made of such properties in the application of circuits such as superconducting switches or in highly sensitive sensors.

TELECOMMUNICATIONS

German Company Predicts Official Approval for ISDN Multiplexer "System 2000"

92P60230C Duesseldorf VDI NACHRICHTEN
27 Mar 92 p 23

[Text] Racal-Datcom, formerly Racal Milgo GmbH, Neu Isenburg, still expects BZT [expansion not provided] approval this spring for its "System 2000." Depending on the application, an ISDN transmission speed of up to 30 times the normal speed of 64 kilobits per second, that is, up to a maximum of 1.92 megabits per second, would be possible. An ISDN live video

connection to Australia should demonstrate the market capability of the ISDN multiplexer "System 2000" and its power capacity.

German Firms Develop Interactive Display Services

92P60230D Duesseldorf VDI NACHRICHTEN
27 Mar 92 p 23

[Text] The Deutsche Bundespost Telekom in Bonn and the Axel Springer publishing house (ASV) in Berlin have developed interactive display services for a wide circle of users. Telekom (at the CeBIT '92 conference in Hannover) and ASV (in Berlin) announced that they have founded the joint company VideoTel Infoservice GmbH and Co KG, with Springer taking the entrepreneurial lead. After a pilot phase, interested suppliers or groups of suppliers had the opportunity themselves to participate in the new company. According to statements by the founding companies, VideoTel uses Telekom's videotext system, which has more than 300,000 connections. The goal is to create a homogenous high-quality product for the private mass market that later could be marketed under its own product name.

Diamant Optical Digital Signal Transmission System Described

92WS0492A Heidelberg NET—NACHRICHTEN
ELEKTRONIK + TELEMATIK in German Apr 92
pp 156-158

[Article by Helmut Feilhauer, Klaus Krull, and Hans-Gerd Zielinski: "Digital-Optical Transmission System for Television and Sound Radio; Fiber Optics Compatible With Copper"—first paragraph is NET introduction]

[Text] There has been great progress in the distribution of television signals over the past decade. The course of development has gone from small individual networks to one extensive network. The transmission media employed for this are satellites like the DFS [German Association for Solar Energy] Kopernikus, directional radio systems as carriers for distribution networks and local-hookup-area coaxial systems, and with shorter carrier distances.

Since 1990, optical systems with analog transmission technology have been employed in both communication-line networks (carrier distances) and local-connection networks. Particularly with respect to carrier distances, fiber optics is today already more economical than copper coaxial cable technology.

The disadvantages of analog optical distribution systems, such as limited range, the need for laser safety devices because of the high transmission level, very high demands on lasers and optical amplifiers with regard to linearity, performance, and noise, as well as the low splitting factors in the television distribution network,

can be eliminated through the employment of digital transmission techniques. This is on condition that there is an economical adaptation to the important features of the existing television distribution network, that is, a gradual introduction of the digital-optical systems, starting from a broadband communications network to the subscriber (fiber to home), integration of the new synchronous digital transmission technology (SDH [synchronous digital hierarchy]), compatibility with present-day subscriber and operational interfaces, suitability for current and future television standards, as well as expandable capacity (number of channels, signal quality, etc.).

The "Diamant" concept of a digital-optical transmission system developed from the ANT [German space electronics firm] communications technology meets all these requirements. Thus, through the above-mentioned measures, an economical solution with a guaranteed future is provided.

The general characteristic of a distribution network is the large number of receivers that are connected with one transmitter. Hence, the cost of the receivers essentially determines the cost of the whole system. For this reason, the receivers have to be as economical as possible.

Description of System

The basic idea of the proposal for this system is analog-digital conversion of the whole 450-MHz transmission band with an analog-digital converter and reversion in the receiver with a digital-analog converter (Figure 1). The analog-digital conversion necessary to achieve this, as well as the transmission bit rate of over 10 Gbit/s, is not yet available with the present state-of-the-art. This is why the solution represented in Figure 2 is applied with Diamant. After digitalization of the individual channels and subsequent frequency conversion, these channels are combined into a partial bandwidth at the transmitter consisting of, for example, 16 television channels. At the receiver this partial bandwidth is reconverted by a digital-analog converter and then restored to the original signal condition (VHF/UHF range) by a subsequent frequency band conversion so that the television sets in use today can continue to be used without additional equipment. Fiber optic transmission is effected with a bit rate of about 2.5 Gbit/s. The number of programs can be increased by connecting several 2.5-Gbit/s systems in parallel and combining the channel groups after digital-analog conversion or by increasing the transmission bit rate (to, for example, 10 Gbit/s, corresponding to 64 television channels). With the same technique, FM, DSR [digital sound radio], NTSC [National Television Standard Code], SECAM [sequential color and memory], and D2-MAC [definition 2 multiplexed analog component] signals are transmitted and distributed.

Network Features

The introduction of new technologies like synchronous ring networks, synchronous digital hierarchy, fiber optic

transmission technology, network management, etc. are leading to more flexible, more powerful networks that are easier to maintain. These technologies are today already being employed with great success in Telekom, the German Federal Post Office telecommunications network. But their deployment is not only of interest to this sector, but also in connection with the broadband distribution network since their advantages also have a bearing on the latter:

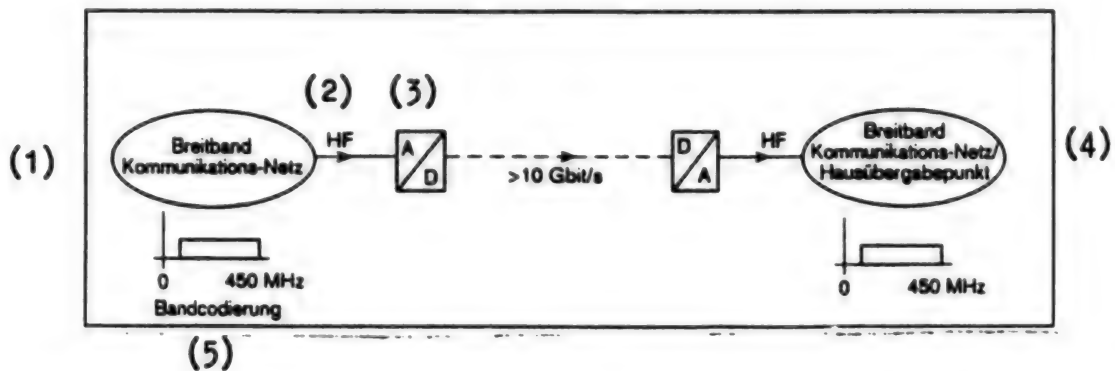
- Rapid connection of calls for existing network access points, for example, between the broadband communication distributor point and one or several superordinate broadband communication amplifier points,
- Making resources available that are not permanently needed,
- Greater availability through automatic replacement switching,
- Constant automatic monitoring of the quality parameters of the lines and systems,
- Connections between regional broadband communication networks, for example, for exchanges of programs,
- Expansion of planning areas and thereby reduction of the number of reception points needed,
- Easy insertion of additional network nodes (for example, superordinate broadband communication amplifier points) in the ring.

The use of synchronous broadband communication networks based on fiber optic systems is particularly advantageous in broadband communication line networks (Figure 3). The superordinate broadband communication amplifier points are connected to the broadband communication distributor point and the broadband communication amplifier points on the user end of the line to the superordinate broadband communication amplifier points by means of a ring network. A local or global management system assumes functions like configuring, monitoring, replacement switching, etc. In it individual signals are already digitalized at the point they are fed into the communication line network (for example, at the radio receiver) and transmitted to the superordinate amplifier point via the synchronous digital hierarchy transmission system. The fiber optic transmission technology required to do this has today either already been introduced into the German Federal Post Office Telekom telecommunications network or will very shortly be introduced into it (for example, SLA-16, synchronous technology for local networks).

The system that has been presented here demonstrates a way of economically making use of digital and fiber optic transmission technologies for television distribution networks. With the introduction of these technologies, we can more advantageously proceed with the introduction of new network structures by means of which operational as well as economic advantages will be realized. The

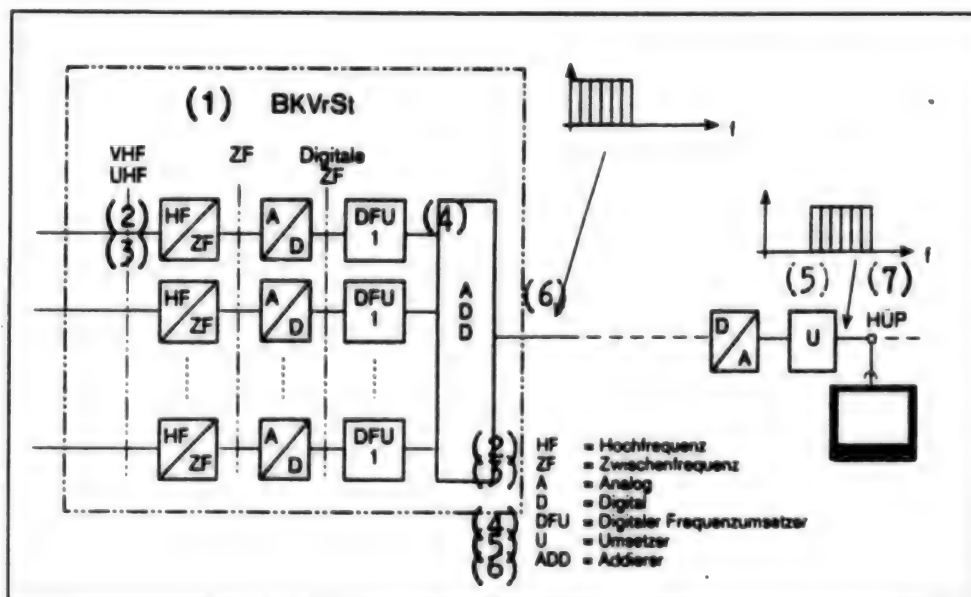
Diamant system for the first time makes possible digital transmission of top-quality television and radio signals over optical fibers from the studio to the

subscriber, a transmission technology that is compatible with the existing coaxial-cable distribution technology.



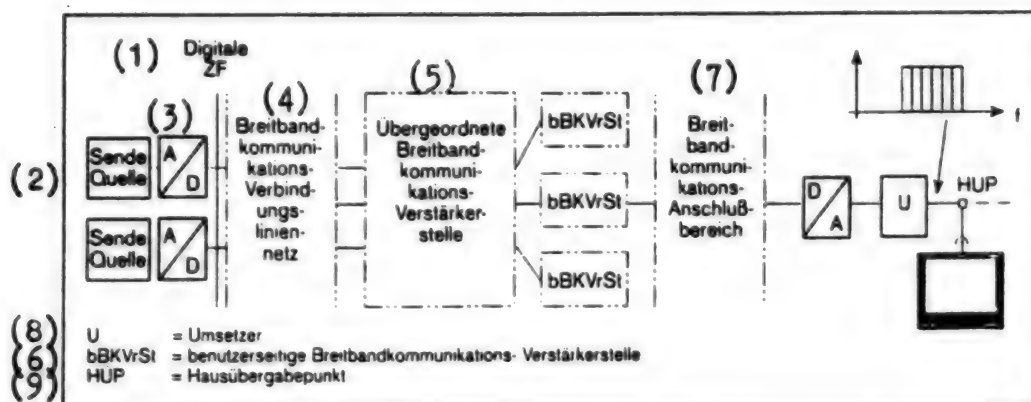
The basic idea of the proposal for the system is the analog-digital conversion of the entire 450-MHz transmission bandwidth.

Key: 1. Broadband communication network. 2. High frequency. 3. A = analog; D = digital. 4. Point at which broadband communication network delivers signals to house. 5. Band coding.



The Diamant Solution.

Key: 1. Broadband communication amplifier point. 2. High frequency. 3. Intermediate frequency. 4. Digital frequency converter. 5. Converter. 6. Adder. 7. Point at which broadband communication network delivers signals to house.



3. Synchronous fiber-optic ring networks.

Key: 1. Digital intermediate frequency. 2. Transmitting source. 3. A = analog; D = digital. 4. Broadband communication line network. 5. Superordinate broadband communication amplifier point. 6. Broadband communication amplifier point at user end of line. 7. Broadband communication connection area. 8. Converter. 9. Point at which broadband communication network delivers signals to house.

Philips Launches Fiber Optic Cable Pilot Projects in Netherlands, FRG

92WS0492B Heidelberg NET—NACHRICHTEN ELEKTRONIK + TELEMATIK in German Apr 92 pp 171-174

[Article by Norbert Hahn: "Fiber-Optic Technology in Local Network; Alternative and More"—first paragraph is NET introduction]

[Text] While optical fiber was up to now intended for use in transmission channels with high bit rates in national, regional, and local networks, it has now reached private households. In a new development area in Amsterdam and in a pilot project in Nuremberg-Boxdorf Philips has added another 200 subscribers to the public telecommunications network with fiber optic cable.

Philips is contributing to the Europe of tomorrow with these field tests that are being implemented on this scale for the first time. In the process fiber optic cable is increasingly replacing copper cable.

Fiber Optics as Means of Transmission

With the digitalization of the telecommunications infrastructure, fiber optic cable is increasingly being used alongside copper cable as a means of transmission. This tendency holds true for long-distance and basic telecommunications networks as well as for local network connections. How copper-cable systems are to be replaced by fiber optic technology in local networks is also under consideration. The implementation of these considerations depends, on the one hand, on the services and applications that will be needed and, on the other, on how economical "fiber-in-the-loop" (FITL fiber optics in local connections) systems are. In connection with this, aside from the elaboration of ideas, emphasis is also

being laid on the implementation of pilot projects. Another important aspect is the long planning period of about 20 years for the network sector during which the demand for services over the same period has to be considered.

Even today, in addition to the existing services in some business sectors, there is a need for broadband services such as video conference, CAD systems, and computer-network connections. With the bit rates of up to 2 Mbit/s necessary for these services, the twin-lead copper lines in use in the subscriber connection sector have reached the limits of their capability.

Another need arises from the increase in the number of broadband subscribers. But the services chiefly used by private subscribers (households) are at present telephone, cable television, and cable radio, as well as ISDN [Integrated Services Digital Network] services in the near future.

Economic Aspect is Essential

As concerns the existing and future need for services, the economic aspect must be very carefully considered. The establishment of a fiber optic network that extends into households must be comparable with the existing twin-lead copper-cable network in terms of both functions and costs. Copper cable can be obtained for about 20 percent of the price of fiber optic cable. This difference in price and the cost of the additional equipment required for the optical-electrical conversion make it difficult for the "fiber-to-the-home" project to compete with similar network topologies implemented with copper cable.

Multiple use of the fiber optic network represents the solution to this problem. In an environment of shared

applications, there are single-point-to-several-point connections (distribution services) from the communications exchange to the end subscriber and several-point-to-single-point connections in the opposite direction. The single-point-to-several-point connection structure can be effected through time division multiplex (TDM) and the several-point-to-single-point connections through time division multiple access (TDMA). With these, flexible assignment of bandwidths is possible.

Passive Optical Networks

The individual optical fibers are fed from the exchange through a passive fiber optic distributor to the distribution point and split up at the junction box. In this way several customers can be individually provided with service. Each customer receives an optical fiber from the distribution point. A TDM signal is transmitted over it from the exchange. The customer's equipment has access to a specific time slot and an assigned signaling channel, which is designated for the reception point in question. Additional interface switching arrangements provide the individual services that the subscriber wishes to have, for example, analog telephone or digital services (ISDN). Digitalized speech or data is retransmitted from the subscribers to the exchange by means of optical TDMA with converging flows of data. These data flows passively overlap one another at the distribution points. The correct sequence is obtained through synchronization of the subscriber's equipment with the rate of transmission from the exchange. At the same time, an interval record—that builds up a delay control in the subscriber's equipment—is utilized so that the exchange recipient can gain access to vacant time slots.

Broadband services are transmitted on a second wavelength. A multiplexer, which serves several subscribers over twin-lead copper cables, is installed at the distribution point and operates "fiber to the curb," FTTC (fiber optics right into one's home).

Single-mode fiber losses are very few in comparison with those of coaxial cables. Thus, transmission over a distance of more than 30 km without an amplifier station is possible. Since the bandwidth is also very broad, there are practically no limits to the expansion of program capacity or the implementation of new services.

Fiber to the Home

During transmission from the terminal to the subscriber over passive optical networks (PON), telephone and television signals at the exchange terminal are converted into optical signals (E/O) and fed into a single-mode fiber. At the far end, the fiber optic cable is split up into several fibers by means of a passive optical distributor, each of which leads to a subscriber station. After reconversion (O/E), the signals are conveyed to the subscriber via transfer points.

The distribution rate, that is, the number of fiber connections that can be made by means of passive optical

distribution, is limited by the potential optical output. It depends on the kind of transmission that is used for the optical signals.

Fiber to the Curb

Because of the high cost of the optical components and/or converters, compared with coaxial-copper systems all FTTH (optical fiber to the home) solutions incur greater expense per transfer point.

With a solution that does not exclude a later switch to fiber to the home and with which the cost per transfer point can be lowered, the optical fiber ends in a junction box with an active distribution point at the curb or at the front of the building. After an O/E conversion, the equipment functions like an amplifier in the B zone of a coaxial-copper network and can serve a total of 70 transfer points. Therefore, this solution is an economical one.

Combined Services Lower Costs

The combined use of optical components further lowers the cost per subscriber.

Cable television and telephone make use of different wavelengths and are brought together in the same optical fiber by means of a wavelength multiplex (WDM). After the first distribution operation, the signals are again demultiplexed with a WDM. After the O/E conversion, cable television signals can be fed into a coaxial distribution network. The television signals are split up by a second distributor and relayed to the subscriber's telephone network terminal.

Distributor, WDM, and O/E converter for cable television are housed in a standard junction box. The network terminals can also be integrated into this box. In that event, the subscriber's telephone is connected through a twin-lead copper cable.

Models in Practical Test

Along with the elaboration of ideas for networks and support for standardization studies, it is necessary to test the feasibility of these models in actual practice. Philips has made use of its own research and development departments to translate the ideas into the corresponding technology in pilot projects.

Close collaboration with each of the responsible network operators has enabled Philips to adapt the idea to their individual network and service requirements.

The flexibility of its design proposals as concerns services and transmission capacity as well as the simple, direct integration of standardized distribution systems (television/radio), together with a modular network management, are producing network topologies with a guaranteed future.

Amsterdam: 200 Optical Fibers in Homes

The Dutch Post and Telecommunications Office has set in motion a pilot "fiber-to-the-home" project in the new development district of Sloten in Amsterdam. For this purpose, Philips connected 200 households to the terminal located in the telephone exchange via eight passive optical networks (with a distribution factor of 1/32). The subscribers now receive telecommunications services and television and radio programs over fiber optic cable. A network management system supports all eight networks.

In this field test Philips created a single-mode fiber optic network that can be efficiently installed and operated with already existing services like telephone and television or radio. In addition, the fiber optic infrastructure was designed in such a way as to be able to also transmit services that are offered in the future.

The goal of the PON pilot project in Amsterdam was to provide an economical optical network based exclusively on existing services like telephone and television or radio (20 FM-television and 32 DSR [digital sound radio] channels) and at the same time to create a fiber optic infrastructure that also supports a large number of new services. The FTTH solution was chosen to provide up to 200 private subscribers with services transmitted through eight passive optical networks.

All the signals are fed into the single-mode fiber from the exchange terminal. The latter is housed in the local telephone exchange. The signal reaches two underground distribution points via two passive optical distributors. From there on groups of 30 subscribers each are then provided with services. The network terminals located with the subscribers have access to the appropriate time slots of the time division multiplex signal (20.48 Mbit/s). Television and radio programs are transmitted through the same fiber optic network on a second wavelength. The application of FM modulation technology to these services provides a high passive distribution factor. Because of this, exchange terminal costs are split up among a large number of subscribers.

Nuremberg: 200 Local Fiber Optic Lines

The German Federal Post and Telecommunications Office is also planning to conduct several field tests in Germany to develop a network standard for local lines (fiber in the loop—FITL) that will provide a suitable infrastructure with a guaranteed future. The Opal 6 system was installed in Nuremberg in September 1991. It is the first passive optical network in Germany. As with the Amsterdam project, 200 subscribers are hooked up to the system. The connections are divided up between two passive radial networks (with a distribution factor of 1/32). POTS [Plain Old Telephone Service] (analog telephone service), ISDN, and Datex-P are among the telecommunications services that are available. Aside from these, the complete cable television program is

offered with a reduced distribution factor. A network management system is also in existence in connection with this.

The network terminal group, with an increased channel capacity of 2 Mbit/s, is housed either with the user (in larger buildings) or at an external distribution point. In the latter case, the existing copper-coaxial-cable infrastructure can be used. The transmission of television and radio signals differs slightly from that of the Amsterdam solution. Amplitude-modulated television signals are required for full cable television transmission capacity and this leads to a reduced passive distribution factor of about one-eighth.

Guaranteed Alternatives for Future

In the years to come fiber optics will take over communications networks in all sectors. New homes are in part being hooked up with the FTTC technology. In future it will be possible to provide subscribers with dialogue and distribution services via fiber optic cable. One's own video programs can also be retransmitted to the exchange, from which they reach the other subscribers along with their dialogue services via the same fiber optic cable.

In view of the long life, more than 20 years, and the high investment cost of local networks, telecommunications administrations and network operators are looking for alternatives to the existing copper-cable networks with a guaranteed future for dialogue as well as distribution services. For one thing, fiber optic solutions provide a guarantee for the future and, for another, fiber optic cable can gradually replace copper cable as becomes necessary.

Interest in FTTL solutions exists not only in the Netherlands and Germany. Philips is discussing them with the post and telecommunications administrations of Australia, Spain, and Switzerland.

EC Commission Proposes 6 Billion Francs To Promote D2-MAC Standard

92WS0512B Paris LE MONDE in French 15 Apr 92
p 18

[Article by Brussels (EC) correspondent Philippe Lemaitre: "European High-Definition Television [HDTV] Strategy: Brussels Offers Six Billion Francs [Fr] in Aid to Promote the D2-MAC [Multiplexed Analog Component] Standard"—first paragraph is LE MONDE introduction]

[Text] During the next five years, the European Community could spend ECU850 million i.e., nearly Fr6 billion, to promote the European broadcasting standard D2-MAC. This is the forerunner of the European HDTV standard, HD-MAC [high-definition MAC] to be implemented in 1995-1996.

On Tuesday, 14 April, the European Commission was expected to offer to the telecommunications ministers of the 12 member countries (who will discuss the offer at their next meeting, on 11 May in Brussels) Fr6 billion in aid to promote the European D2-MAC television standard. The decision, on the advice of the European Parliament, will have to be adopted unanimously. The community funds will be destined, in that order: to broadcasters (television channels), to the programming industry (channels or independent producers), and to cable operators. They would receive respectively about 60, 25 and 15 percent of the available credits. In all three cases, the European budget will cover the excess cost resulting from the use of the D2-MAC standard, compared with the current PAL [phase alternate line] and SECAM [sequential memory color] standards.

This financing proposal completes the guideline concerning the progressive introduction of the intermediate European standard D2-MAC, the broad lines of which were approved by the telecommunications ministers in December 1991; it should be formally adopted in the next few weeks, after an uneventful "second reading" in the European Parliament. The guideline, which confirms D2-MAC as the European standard for satellite broadcasting, provides that, as of 1995, new services must be broadcast in D2-MAC, but it does not impose any implementation calendar on channels which are broadcasting in PAL or SECAM.

The Success of the Olympic Games

In addition, and in accordance with the project devised already one year ago by Mr. Filippo Maria Pandolfi, vice president of the commission in charge of research and technological policy, the strategy deployed to promote the new European television standards (D2-MAC followed by HD-MAC) should be supported by a third pillar, the MOU [Memorandum of Understanding]. This is an arrangement to be agreed on by the various professional players concerned (manufacturers making the new TV sets, telebroadcasters, satellite and cable operators); they would each individually make the commitments required to ensure the smooth introduction of the D2-MAC and then the HD-MAC standards. At the Commission headquarters, people feel sure that the MOU will actually be signed during the next few weeks by the vast majority of the players concerned.

This seems to denote a change in mentalities. Those who were resolutely opposed to the guideline last fall seem to have become more flexible. In fact, people in Brussels say, the market has shifted. The broadcasting of the Albertville Games in D2-MAC was perceived as a success. Besides, as it turned out, the manufacturers (Thomson and Philips) are able to offer "16/9" receivers in sufficient quantities. D2-MAC programs are being produced. Finally, the risk of a fully-digital HDTV (meeting European quality standards) being introduced on the market before 10 years is no longer taken as seriously as it used to be.

Philips Presents ISDN Innovations

92WS0541E Chichester INTERNATIONAL
TELECOMMUNICATIONS INTELLIGENCE
in English 6 Apr 92 p 5

[Text] Hilversum-based Philips Business Communications has unveiled a new range of private ISDN telephones, known as the SOPHO-SET P-range.

The telephones are equipped with a software package providing the same functionality and user interface as the existing S-range. Communication is by means of the proprietary Layer 3 Terminal Message Protocol.

The P-range terminals can be connected to the 4-wire Digital Line Card of the SOPHO-S ISPBX or to the Private Network Termination (PNT1). The advantage here is that the new P-range allows the customer to choose one uniform type of line interface at all extensions. At distances of up to 1 km point-to-point, the P-sets can be connected directly to the PBX, with two voice-only sets or one voice/data set connected to one four-wire S₀ interface. The PNT1 extends the connection distance by up to 2 km and can also be used where existing two-wire cabling does not allow for the connection of four-wire ISDN terminals.

Because of the multi-protocol capability of the S₀, the user can connect special ISDN equipment such as Group 4 facsimile and ISDN PC-cards which need extra protocol elements not yet provided by the standard ISDN. The P-range permits the customer to decide whether a two-wire or four-wire infrastructure will be used, depending on the distances involved and the equipment to be connected.

Philips' P-range of terminals comprises the SOPHO-SET P375(D), the SOPHO-SET P370(D) and the terminal adapter SOPHO-LAM P375 which is a data-only terminal providing V.24 data communications connection to other devices, such as a PC or VDU.

Extends Range of Telephone Headsets...

Meanwhile, Philips is extending its range of telephone headsets for the SOPHO-S range of digital PBXs with a new model from Plantronics International. Plantronics has developed two headsets for Philips' SOPHO-S range. The latest, the Supra, has just become available worldwide. The Supra can be directly plugged into the Philips SOPHO-SUPERVISOR 30 and 50 operator consoles and their range of P and S series digital telephone sets.

Plantronics currently supplies the Spectra headset for two telephones available with Philips SOPHO-K key telephone systems.

Launches ISDN PC-Card...

In a third announcement, made at CeBIT, Philips Business Communications launched a new ISDN PC-card. Known as the PConnect, the card slots into a PC to

provide an intelligent S₀ interface to an ISDN PBX, such as Philips SOPHO-S, or to the public ISDN.

PConnect comprises the PC-card and a range of software packages, each of which offers an application for enhancing the PC and exploiting the properties of the ISDN infrastructure, whether it be a private network based on networked SOPHO-S nodes or the public ISDN infrastructure, where it is available.

The first release of PConnect offers a number of software applications, including LAN routers, which allow the PC to become part of a LAN by using the ISDN as an extension of the LAN. Four different LAN routers are offered: NetBIOS, Novell Netware, TCP/IP and IEEE 802.2 (SNA).

Among the other applications is one which converts the PC into a screen-based telephone terminal, with personal electronic telephone directory, screen dialing, calling name and/or number display, list of unanswered calls, etc. Another provides telematics services, enabling the PC to be used as a Group 3 and/or Group 4 facsimile, as a Teletex terminal, for PC-to-PC file transfer and for Computer-Integrated Telephone functions; while a further application provides COM Port Emulation, allowing any commercially available MS-DOS-based data communications software package to be used for data communications between the PC and remote terminals. There is also an application package which allows use of a two-wire device, such as an answering machine, Group 3 facsimile or a standard analogue telephone set, in conjunction with the PC, while taking advantage of the 2B + D facility of the ISDN. An applications programming interface library is provided for developing customised applications.

Software applications will be developed continuously and will be added to the PConnect range as they become available, said Philips.

Baltic: Nokia To Supply Submarine Fiber Optic Cable Links

92WS0541F Chichester INTERNATIONAL
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[Text] Nokia Cables of Finland has received two contracts worth FM30 million in total to supply submarine fibre optic cable and accessories for telecommunications links under the Baltic Sea.

Telecom Finland and Swedish Telecom (Televerket) have contracted the company to supply cable for a link between the two countries. Designated SF-S 4, the cable will be equipped with 2.5 Gbit/s line systems, the highest transmission capacity currently available, initially providing 30,720 telephone circuits per fibre pair. The cable will have six pairs of fibres for international traffic which means it can be upgraded to provide 184,320 telephone circuits. The cable will also serve data transmission and TV communications.

SF-S 4 is expected to be ready for service towards the end of Summer 1993, interconnecting Turku in Finland, Mariehamn on Aland island and Nontalje, Sweden. It will be the fourth telephone cable to be installed between Finland and Sweden. The old cables, which were laid in 1927, 1938 and 1952, have already been taken out of service.

The new cable will provide the main route for telecommunications traffic between Finland and Sweden. Today, almost all the traffic is transmitted via microwave links across Arland.

Telecom Finland and Swedish Telecom also plan to implement a second fibre optic cable, SF-S 5, which they hope will be ready for service in the Fall of 1994.

The second contract calls for Nokia to supply submarine fibre optic cable to form a link between Helsinki, Finland and Tallinn, Estonia. This cable, SF-ES 2, will be installed in the Fall of 1992 and will be the first international fibre optic link to terminate in the former Soviet Union territory.

SF-ES 2 will provide a transmission rate of 34 Mbit/s on two fibre pairs, equivalent to 960 telephone circuits. Transmission capacity on this cable can be expanded when the need arises.

The new cables will be installed by Telecom Finland and Swedish Telecom under the supervision of Nokia. For the laying operations, the Finnish cableship C/S Telepaatti and the Swedish ship C/S Plejel will be used.

SF-S 4 and SF-ES 2, and later SF-S 5, will form an integral part of a larger international telecommunications network planned for the Baltic region.

In April 1991, Telecom Finland, the Ministry of Posts and Telecommunications of Estonia and Swedish Telecom formed the Estonian Mobile Telephone Company to establish a cellular mobile telephone system in Estonia (see ITI Issue 289).

European Consortium Gets EC Support for EDI Interconnectivity Service

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[Text] A European consortium comprising Infonet, Swedish Telecom International, Telefonica Servicios of Spain and PostGEM of the Republic of Ireland, has been selected by the Commission of the European Communities to provide a European EDI interconnectivity service under the TEDIS 2 program [Trade Electronic Data Interchange Systems]. TEDIS is run by the EC's DG XIII [Directorate General for Telecommunications, Information Industries and Innovation].

Coordination at Community level for the development work involved in EDI will be provided by the consortium, which "promotes the conditions for a rapid and coordinated expansion of the use of EDI within the

Community and EFTA [European Free Trade Association] countries," discouraging the proliferation of closed EDI systems. Partly funded by the TEDIS program, the consortium intends to have a fully operational service later in 1992.

Leader of the consortium, Neil Rafferty of Infonet UK, states that "this platform will allow all European EDI service providers to connect to it, using messaging standards based on EDIFACT and publicly available interface specifications." Infonet is to supply the EDI interconnectivity service software and the end-user software. Swedish Telecom will support an Infonet-based EDI relay service in Stockholm, acting as the "clearing house" for other EDI clearing houses in Europe. A backup relay service center for the consortium will be provided by Telefonica Servicios, a subsidiary of Telefonica de Espana S.A. Irish PostGEM is contributing to

the interconnectivity project in terms of software design and product development. Project management will be coordinated by U.K. company, Level-7, an independent information technology consultancy company.

A team led by U.K.-based Applied Network Research Ltd. has been awarded a contract by the TEDIS program to "review the current and probable future developments of EDI in the financial sector at a European level, compare it with developments in the rest of the world and draw conclusions and recommendations of interest to the [EC] Commission, consumers, the major players in the European financial sector and standardization bodies and member states" (TEDIS Project B11). Other members of the team include: KPMG of Germany, Delahale Consultant of France, the Cranfield School of Management of the U.K., Minerve Consulting of Belgium, and Omdal Associates of Norway.

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